9.0 DEVELOPMENT OF ALTERNATIVES

In this section, remediation alternatives are developed from the remediation technologies retained after screening. The technologies are combined to create a wide range of alternatives that represent various approaches to achieving remedial action objectives. The alternatives are then evaluated in Section 10.

Under WAC 173-340-360(2)(a) remediation alternatives are developed to meet the minimum requirements previously identified in Section 8.1 and include:

- Protect human health and the environment.
- Comply with cleanup standards.
- Comply with applicable laws and regulations.
- Provide for compliance monitoring.

Other requirements under WAC 173-340-360(2)(b) include utilizing permanent solutions to the maximum extent practicable and providing for a reasonable restoration time frame.

Cleanup technologies are evaluated in consideration of the hierarchical criteria presented in WAC 173-340-360(3)(f) and listed below:

- Protectiveness,
- Permanence,
- Cost,
- Effectiveness over the long term,
- Management of short-term risk,
- Technical and administrative implementability and,
- Consideration of public concerns.

The WAC 173-340-360 definition for each of these criteria was previously presented in Section 8.1.

Considering MTCA regulations, other ARARs, remedial action objectives, and the technology screening, the following alternatives have been assembled:

Alternative 1: No Action
Alternative 2 Institutional Control and Monitoring
Alternative 3: Capping - Monitoring and Institutional Controls
Alternative 4: Excavation and Off-Site Landfill
Alternative 5: Excavation and On-Site Treatment
Alternative 6: Excavation and Off-Site Treatment

These alternatives are described and developed below in Sections 9.1 and 9.2. It is necessary to make a number of design assumptions to fully develop and evaluate each alternative. These design assumptions are representative of the technologies used in the alternatives. However, the design assumptions used here are not necessarily the same as the design basis that would be used for the

final, detailed design. In most cases, additional investigations may be necessary to allow final design. Waste characterization would be required following excavation for potential treatment or disposal.

9.1 Common Elements

Several alternatives share common elements in their formulation. To avoid repetition, this section presents the descriptions of elements common to two or more alternatives. These common elements are then referenced in the descriptions of the alternatives.

9.1.1 Institutional Controls

Institutional controls are a key component to maintain long-term effectiveness for alternatives where COCs remain above cleanup levels on-site following completion of remedial action. Deed restrictions would be instituted for Alternatives 2 and 3 to ensure that site use restrictions remain in force regardless of the property owner and to notify any prospective purchasers of the presence of subsurface hazardous substances. For capping alternatives, restrictions would prohibit penetrating the cap and any site use that could damage the cap or significantly reduce its effectiveness. Warning signs would be used to provide notice of the presence of a contaminated site. Site use restrictions would remain in force indefinitely.

Permanent fencing is not addressed in any of the alternatives, because the existing fence would provide adequate protection against direct contact for passersby until a cap could be installed or the COCs above MTCA cleanup criteria are removed. Signage would be placed to educate Site workers of hazards and restrictions. Periodic site inspections and maintenance of a cap, fencing, signs, and any other physical components of the institutional controls would be included in the cap alternative.

The only location identified on-site where groundwater has been impacted above MTCA cleanup criteria is a limited area at MW-11. Therefore, groundwater use restrictions are necessary under the capping alternative.

9.1.2 Monitoring

Monitoring is included as part of all alternatives, except Alternative 1 (No Action). Separate monitoring programs will be used for the compliance/short term (during remedial action and verification period) and the long term (following completion of remediation). Compliance/short-term monitoring is viewed being conducted for a period of up to five years, long-term monitoring is viewed as being on the order of 20 years. The monitoring requirements will be evaluated if required as part of the Cleanup Action Plan (CAP). In particular, monitoring frequency and number of years over which monitoring will be required will be defined in the CAP. Detailed monitoring plans will be developed for the selected remedy during final design for public comment and Ecology approval.

9.1.2.1 Short-Term Monitoring

Short-term monitoring is required during remediation to ensure that there are no adverse effects from remediation activities, to provide quality control, and to confirm the attainment of cleanup standards and/or relevant performance criteria. Health and safety monitoring is also performed to ensure that site workers are not exposed to undue or unexpected risks.

Short-term monitoring to demonstrate attainment of cleanup standards is applicable for Alternatives 4, 5 and 6 because affected soil will be removed and either treated on- or off-site or disposed of off-site. This monitoring would include confirmatory soil sampling and analysis to verify

the attainment of cleanup standards in the contaminated areas. No monitoring would be required for Alternative 1 (No Action).

9.1.2.2 Long-Term Monitoring

Long-term monitoring is conducted to 1) verify that the remedy performs as expected over time, and 2) allow timely maintenance of a cap (Alternative 3) and other physical components of an alternative. Periodic site inspections and surveys would be sufficient for determining maintenance needs and monitoring cap performance. Cap performance is also measured by groundwater monitoring. Long-term cap and groundwater monitoring would continue during the post-closure period, assumed for the purposes of the FS to last 20 years per WAC 173-340-350, and then cease. It is not expected that long-term monitoring (20 years or more) would be required for Alternatives 4, 5 or 6.

Cap Monitoring. Cap monitoring would consist primarily of visual inspections for damage and subsidence. The cap would be periodically examined for the presence of offsets, scarps, low-points, ponded water, odd changes in grade, and excessive erosion. For the first year, such inspections may be performed quarterly and may then be reduced to once or twice per year.

Groundwater Monitoring. Groundwater monitoring would include periodic groundwater sampling and analysis at selected key locations throughout the site to confirm that COCs do not exceed acceptable limits. Site groundwater is currently not substantially impacted, so the monitoring program will be designed predominately for detection of release of petroleum constituents into site groundwater, should it occur. The existing monitoring wells should be sufficient for this purpose with the addition of one monitoring well down-gradient of MW-11. Groundwater monitoring is included in all alternatives as a threshold requirement under WAC 173-340-360.

9.1.3 Excavation

Excavation is included in Alternatives 4, 5 and 6. Excavation of contaminated soil would protect human health and the environment by locating and removing affected soil from the Site.

The cleanup criteria considered in the removal alternatives involves removal to meet MTCA cleanup levels protective of human health and the environment. Removal of COCs to detection limits was not considered due to the practical benefit compared to costs. If groundwater impacts are not entirely remediated under the removal alternative, institutional controls may be required for the Site.

Prior to initiation of construction activities, some of the existing Site fence may be taken down to facilitate remediation activities. Temporary fencing will be placed around the perimeter of the excavation and loading area.

Conventional construction equipment such as backhoes scrapers would be used for contaminated soil excavation. Excavation equipment would not require decontamination until completion of the project, as long as the equipment remains within the fenced project area. Equipment will be decontaminated prior to removal from the fenced project area.

Excavation will be performed according to standard industry practices. Water spray would be used if necessary for dust suppression during excavation and loading activities. Low volume water sprays will be applied to material surfaces using equipment appropriate for the task. Water trucks will be used for suppression of roadway dust if necessary.

The average depth of the excavation is anticipated to be 4 to 5 ft bgs. Means of egress for both personnel and equipment would be provided in accordance with Washington State Labor and Industry requirements (WAC 296-155). If excavation depth should exceed 4 ft, the excavation side slopes will be 1.5 ft horizontal to 1 ft vertical (WAC 296-155-657) or properly shored for stability.

Excavated soils may be placed directly into the transport vehicles, or loading may occur from temporary stockpiles next to the excavation.

All excess water (if present) would be drained from soil in trucks prior to transporting soil from the excavation area. Impacted drainage from the trucks will be captured and treated on-site then discharged or taken off-site for treatment and disposal. On-site stockpiles would be placed on sheeting and have berms constructed of soil, hay bales, or other suitable materials sufficient to prevent off-site migration of the stockpiled soils. Stockpiles would be covered overnight to minimize wind-blown dust or exposure to precipitation.

Transport vehicles and transportation will be provided by the contractor. Conventional highway approved equipment would be used, and could include standard dumps, pony trailers and roll-off containers. All contaminated soil loads would be covered during transport to the disposal facility.

The excavation would remain open and secured until confirmation sampling results have been received and evaluated, and approval has been obtained from Ecology stating that the selected cleanup criteria have been achieved. The excavated area would then be backfilled with clean fill and the area will be returned to its original grade. Backfill would be placed in lifts and compacted to a stated compaction level within a defined moisture content range that will be specified in the design report.

9.2 Description of Remediation Alternatives

9.2.1 Alternative 1: No Action

A "no action" alternative is included as a baseline for comparison to the other alternatives. This alternative would leave the Site in its current state assuming no restrictions on future site use and no site maintenance or monitoring.

9.2.2 Alternative 2: Institutional Controls and Monitoring

This alternative would decrease potential site risks by preventing exposure to COCs in the contaminated areas at the Site. Public exposure would be prevented by a physical barrier in the form of fencing with warning signs, and by preventing site use via deed restrictions.

Long-term maintenance and monitoring would be included to ensure the continued effectiveness of the remedy. This alternative would consist of implementing and maintaining institutional controls as described in Section 9.1.1 and long-term monitoring as described in Section 9.1.2. Institutional controls would prevent direct exposure to impacted soil through fencing and site use restrictions. Because this alternative relies on institutional controls more than physical covering of the contamination for its effectiveness, the site would be dedicated as a hazardous site and not available for beneficial use.

Groundwater at this site is currently not significantly impacted. However, groundwater monitoring would be provided to detect future groundwater impacts in the unlikely event that they were to occur.

9.2.3 Alternative 3: Capping – Monitoring and Institutional Controls

This alternative would protect human health and the environment by providing proven, reliable containment of any affected soil in the contaminated area. If this alternative were selected, an appropriate cap design would be selected during detailed design. For the purposes of this FS, an asphalt cap has been used as a representative process option.

The cap would prevent collection and infiltration of stormwater run-on, provide a barrier against direct contact with any waste or affected soil, and prevent off-site migration of COCs in stormwater run-off or airborne dust. The extent of the cap would cover the contaminated areas above the detection limit criteria. Long-term effectiveness of this alternative is contingent on the monitoring and maintenance of the integrity of the cap for a minimum period of up to 20 years or more.

The major steps in this alternative are:

1. Fill and grade the site for even slope and good stormwater drainage.
2. Place a low-permeability cap over the contaminated area, including appropriate surface water controls.
3. Maintain the cap for 20 years.
4. Implement and maintain institutional controls and monitoring (as described in Sections 9.1.1 and 9.1.2.

The area that would be capped is shown in Figure 9-1. This area covers the areas with soil containing COCs above the cleanup goals (based on RI data).

Suitable land uses would include commercial, industrial, and/or recreational, but not residential. Short-term exposure to the contamination (i.e., during construction) would not present unacceptable risk with regard to worker exposure during construction with proper health and safety controls. Health and safety considerations during grading and construction would be implemented.

Groundwater at this site is currently not impacted significantly. However, groundwater monitoring would be provided to detect future groundwater impacts in the unlikely event that they were to occur.

9.2.4 Alternative 4: Excavation and Off-Site Landfill

This alternative would protect human health and the environment by locating and removing any affected soil from the contaminated area for off-site landfill disposal. This alternative would involve excavation to achieve final remediation goals or cleanup levels established in the CAP. Removal of COC to the Cleanup goals identified in Section 7.0 would require the excavation of soil in the Central Portion of the Site and near MW-11. The areas that would be excavated are shown on Figure 9-2. Excavation would follow the procedures outlined in Section 9.1.3. Transporting impacted soils to a landfill would require the import of replacement fill materials for backfill.

The Rabanco landfill has agreed to accept and provide disposal at their landfills for contaminated soils generated during this remediation project. Rabanco's intent is to recycle the soils as landfill cover. The landfill is located approximately 150 miles from the Site. The likely transportation route out of town will be via U.S. Highway 17 to minimize traffic issues. However, the transportation of excavated soil off-site and the return of semi-trailers would impact traffic in the immediate vicinity of the Site.

9.2.5 Alternative 5: Excavation and On-Site Treatment

This alternative would protect human health and the environment by locating and removing any affected soil from the contaminated area and treating it on-site by thermal desorption. This alternative would involve excavation to achieve final remediation goals or cleanup levels established in the Draft Cleanup Action Plan (DCAP). Removal of COC to the Cleanup goals identified in Section 7.0 would require the excavation of soil in the Central Portion of the Site and near MW-11. The areas that would be excavated are shown on Figure 9-2. Excavation would follow the procedures outlined in Section 9.1.3.

Excavated material will be stockpiled and treated on-site using a mobile thermal desorption unit. Mobile thermal desorption units typically process 12 to 15 tons per hour. On-site treatment has the potential for reusing the treated soil as backfill, if it can properly compact. The process rate of the thermal desorption unit and length of working day can greatly affect the cost efficiency of on site treatment. Additional permitting is also required for air emissions on-site for treatment.

9.2.6 Alternative 6: Excavation and Off-Site Treatment

This alternative would protect human health and the environment by locating and removing any affected soil from the contaminated area for off-site treatment. This alternative would involve excavation to achieve final remediation goals or cleanup levels established in the CAP. Removal of COC to the cleanup goals identified in Section 7.0 would require the excavation of soil in the Central Portion of the Site and near MW-11. The areas that would be excavated are shown on Figure 9-2.

Excavated material will be hauled to a facility capable of thermal treatment. TPS Technology Inc. (TPS) is a facility in Tacoma, Washington capable of the required treatment and willing to accept the contaminated material. Treated material could then be sold to the general public as fill. The transportation of excavated soil off-site and the return of semi-trailers would impact traffic in the immediate vicinity of the Site. In addition, transporting impacted soils to the treatment facility would require the import of replacement fill materials for backfill.